6.16 PUBLIC HEALTH

This section describes the existing public health environment, maximum potential impacts from the Project at the Morro Bay Power Plant (MBPP), and design features that keep these impacts below public health-related thresholds of significance. Aspects of the current plant that benefit public health include the use of optimized stack height to reduce ground-level concentrations of emissions and the sole use of clean-burning natural gas. These design and operating aspects will continue to keep potential public health impacts below a level of significance. As discussed in Section 6.15 - Hazardous Materials Handling, multiple design features will be implemented to assure that potential public health impacts of a hypothetical accidental release of aqueous ammonia will also be kept below a level of public health-related significance.

The Project will use combined-cycle combustion turbine generator (CTG) technology to minimize emissions of pollutants, and hence, to minimize potential effects on public health. Potential health risks were comprehensively assessed, and determined to be below their significance thresholds.

Because existing and future public health risks are below significance criteria, no residential or sensitive receptors are or will be impacted. Sensitive receptors are groups of individuals including infants, children, the elderly and chronically ill, that may be more susceptible to health risks from air pollution. Schools, day care facilities, convalescent homes, and hospitals are of particular concern. The sensitive receptor nearest to existing Units 1 through 4 is a school located approximately 2,500 feet east/southeast of the stacks on these units (see Receptor No. 3 in Table 6.16-1 and Figure 6.16-1). The sensitive receptor nearest to the proposed CTGs is a different school located approximately 1,500 feet to the north (see Receptor No. 2 in Table 6.16-1 and Figure 6.16-1). Other sensitive receptors located within 2 miles of the site are also listed in Table 6.16-1 and shown in Figure 6.16-1. Figure 6.16-1 shows offsite sensitive receptors and terrain above stack height to a distance of 2 to 3 miles, in accordance with California Energy Commission (Commission) requirements (Ringer, 1999). The figure shows no public health impacts because indices of potential carcinogenic risk and chronic and acute health hazards are below significance thresholds at and beyond the MBPP site boundary.

Beneficial aspects of the Project regarding protection of public health include the following:

- Clean-burning natural gas as fuel.
- CTG technology to minimize the amount of fuel needed to produce electricity.

TABLE 6.16-1

OFFSITE SENSITIVE RECEPTORS AND THEIR COORDINATESMORRO BAY POWER PLANT

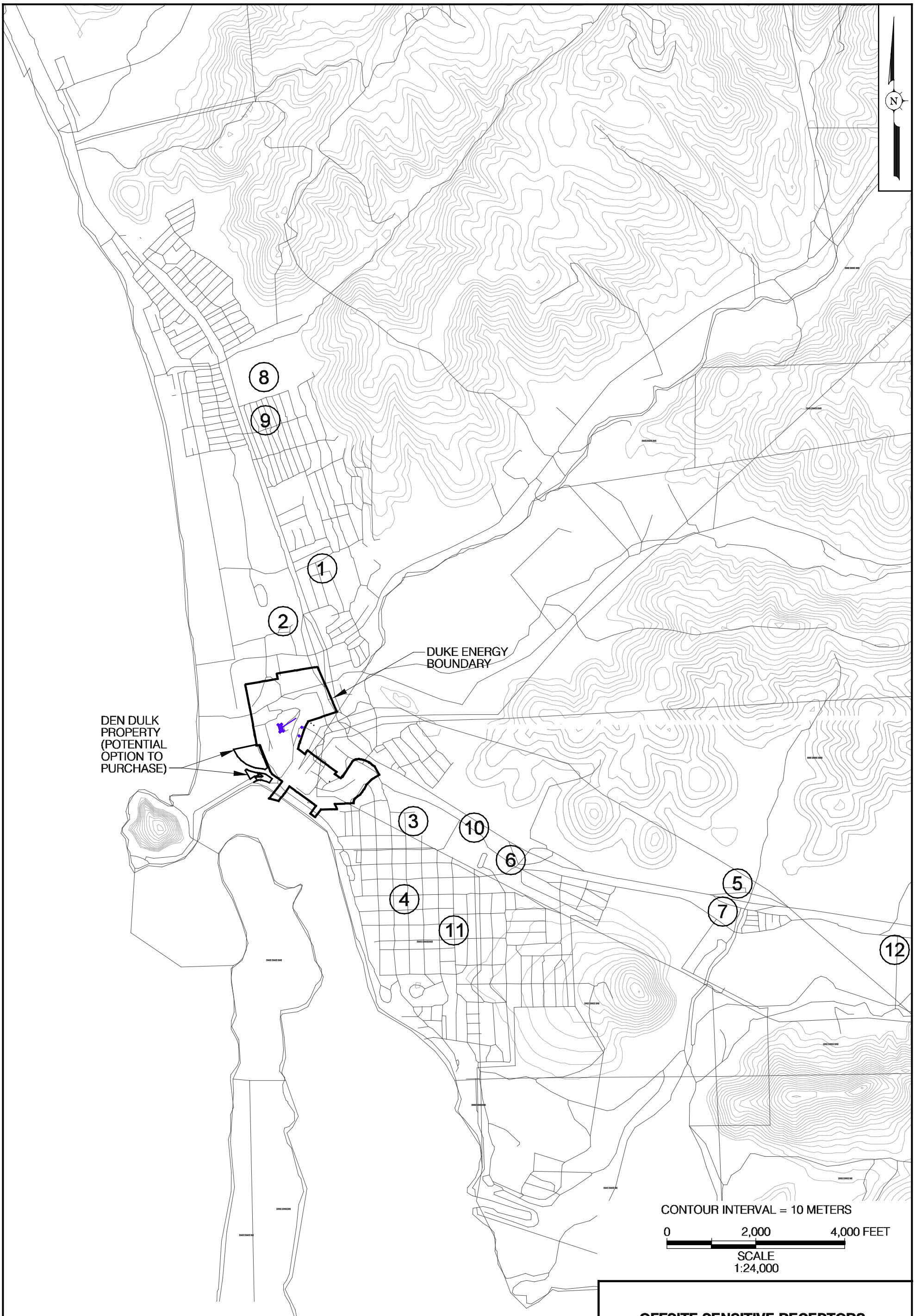
NO.	RECEPTOR/TYPE	UTM (E)[1] (Meters)	UTM (N)[2] (Meters)	DISTANCE FROM CTG STACKS (feet)[3]
1	Day Care Center, 447 Hillview	694,845	3,917,877	3,700
2	Morro Bay High School, 235 Atascadero	694,577	3,917,515	2,400
3	Morro Elementary School, 1130 Napa	695,470	3,916,143	3,600
4	Pacifica Preschool/Day Care Center, 685 Monterey	695,409	3,915,607	4,800
5	Retirement Home, 1405 Teresa	697,697	3,915,716	10,900
6	Estero Bay Day School, 853 Quintana	696,140	3,915,877	6,000
7	Adult Day Health Care, 1475 Quintana	697,594	3,915,523	10,800
8	Del Mar Elementary School, 501 Sequoia	694,445	3,919,190	7,900
9	Retirement Home, 2910 Cedar	694,455	3,918,893	6,900
10	Montessori School, 600 Quintana	695,887	3,916,098	4,900
11	Retirement Home, 537-A Piney Way	695,748	3,915,394	6,000
12	Social Service Facility, 445 Chorro Creek	698,774	3,915,260	14,700

98-710/Rpts/AFC(text) Tbls&Figs (Sect. 6.16) (10/14/00/mc)

(1) UTM (E) = Universal Transverse Mercator, east in NAD 83.

(2) UTM (N) = Universal Transverse Mercator, north in NAD 83.

(3) Distance between center of receptor property and a point centered between the four stacks of the combined-cycle combustion gas turbines, rounded to the nearest 100 feet.



NOTES
1. ELEVATION CONTOURS SHOWN ABOVE STACK HEIGHT.
2. (1) ARE SENSITIVE RECEPTORS LISTED IN TABLE 6.16-1.
3. THIS MAP DOES NOT EXTEND OUT TO TEN MILES BECAUSE NO SIGNIFICANT IMPACTS ARE CAUSED BY THE PROPOSED PROJECT.

OFFSITE SENSITIVE RECEPTORS AND TERRAIN

DUKE ENERGY MORRO BAY LLC
MORRO BAY POWER PLANT

TRC

FIGURE 6.16-1

- Selective catalytic reduction (SCR) to minimize nitrogen oxides (NO_x) emissions.
- Optimized stack height to reduce ground-level concentrations of exhaust pollutants below public health-related significance thresholds.

This section presents the methodology and results of a human health risk assessment performed to evaluate potential impacts associated with airborne emissions from the construction and operation of the Project. Potential public health risks associated with the offsite transport and hypothetical onsite accidental release of aqueous ammonia are discussed in Section 6.15 - Hazardous Materials Handling. Public health aspects of potential exposure to transmission line electric and magnetic fields are discussed in Section 6.18 - Transmission Systems Safety and Nuisance. Potential safety and health impacts relative to MBPP employees are discussed in Section 6.17 - Worker Safety.

Project emissions to the air will consist of combustion by-products from natural gas-fired CTGs. Existing minor sources that will continue to emit small amounts of pollutants are the diesel-fueled emergency generator and fire pumps, and evaporation of volatile compounds from maintenance activities and the onsite gasoline pump. After dispersion to the ground-level locations of public receptors, inhalation is the main pathway by which air pollutants can potentially cause public health impacts. Other pathways, including ingestion of soil, food, and water, and dermal contact are also evaluated for potential exposure. As discussed below, these health risks are not significant.

This public health section is organized to first discuss the different kinds of air pollutants and health risks, and the methodology used in health risk assessment. The existing conditions of air emissions and potential health risks are presented, followed by the assessment of potential health risks from the Project.

6.16.1 HEALTH RISK ASSESSMENT

Criteria air pollutants are discussed in detail in Section 6.2. Those pollutants for which ambient air quality standards have been set by either the federal government (i.e., U.S. Environmental Protection Agency [EPA]) or the State of California (Air Resources Board [ARB]) are defined as criteria pollutants. Criteria pollutants include the following:

- Nitrogen dioxide (NO_2)
- Sulfur dioxide (SO_2)
- Carbon monoxide (CO)
- Particulate with aerodynamic diameter less than or equal to 10 micrometers (PM_{10})
- Particulate with aerodynamic diameter less than or equal to 2.5 micrometers ($PM_{2.5}$)

- Ozone (O_3)
- Sulfates (SO_4)
- Lead (Pb)
- Hydrogen sulfide (H_2S)

Precursor emissions for ozone include nitrogen oxides (NO_x) and reactive organic gases (ROG). This latter category, ROG, includes noncriteria pollutants (e.g., acetaldehyde, benzene) that can potentially cause health effects. The criteria pollutant categories, PM_{10} and $PM_{2.5}$, also can include noncriteria pollutants (e.g., arsenic, copper, selenium,) that can potentially cause health effects.

Potential health effects are of different kinds, both carcinogenic and noncarcinogenic, and hence are analyzed differently and discussed separately.

6.16.1.1 Health Risks

6.16.1.1.1 Carcinogenic Risk

Carcinogenic risk is the estimated chance of contracting cancer over a human life span, assumed to be 70 years, due to environmental exposure to specific substances. Carcinogens are assumed to have no threshold below which there is no human health impact. Any exposure to a carcinogen is assumed to have some chance of causing cancer; the lower the exposure, the lower the risk (i.e., a linear, no-threshold model). To be conservative, the Commission considers an incremental carcinogenic risk from a project of less than 1-in-1-million at a sensitive receptor to be an insignificant impact on public health (Ringer, 1999). San Luis Obispo County Air Pollution Control District (APCD) Rule 219 also applies this threshold if the Project would increase toxic emissions from the MBPP. In contrast, upon application of Best Available Control Technology (BACT) for toxics (Toxics - BACT), a 10-in-1-million risk is used in Rule 219. The same higher threshold is used in the Air Toxics "Hot Spots" program (Assembly Bill [AB] 2588), and California's Proposition 65 as the threshold for further action (e.g., public notification).

The total risk of cancer from all causes in the United States today is about 250,000-in-1-million (or 25 percent). For perspective, total carcinogenic risk from air pollution is about 1,400-in-1-million on average in the South Coast Air Basin (i.e., Los Angeles area), mostly caused by diesel exhaust (SCAQMD, 1999). Environmental and occupational exposures are only a small portion of our involuntary risks. Yet, these exposures are a principal focus of regulatory policy because they can be reduced by regulatory initiatives.

6.16.1.1.2 Noncarcinogenic Risk

Noncarcinogenic health effects can be either chronic or acute. Adverse health effects from prolonged exposure to those noncriteria pollutants that can accumulate in the body are termed chronic. Because accumulation typically occurs slowly, symptoms of chronic effects usually do not appear until long after exposure commences. In determining potential noncarcinogenic health risks from noncriteria pollutants, it is assumed that there is a concentration of each pollutant, the reference exposure level (REL), below which there would be no impact on human health. The lowest no-effect chronic exposure level for a noncarcinogenic noncriteria pollutant is the REL. Below the threshold, the body is capable of eliminating the pollutant rapidly enough to prevent its accumulation.

The chronic health hazard index for a noncriteria pollutant is defined as the long-term (annual) average concentration of the noncriteria pollutant divided by the chronic REL for that pollutant. Health hazard indices for chronic noncriteria pollutants that affect the same organ or system (e.g., respiratory system) are added to obtain the overall chronic health hazard index for that organ or system. To be conservative in this health risk assessment, chronic health hazard indices for different organs were summed. The chronic RELs used in the hazard index calculations were those published in CAPCOA (1993). The APCD Rule 219 significance threshold for chronic health hazard index is 0.1 if the Project increases toxic emissions, but is 1.0 if the Project does not increase toxic emissions and if Toxics - BACT is applied to facility sources of toxics.

Adverse health effects caused by a brief exposure to a noncriteria pollutant of no more than 24 hours are termed acute. The air concentration required for a noncriteria pollutant to cause an acute effect is higher than the concentration required to cause a chronic effect because the duration of exposure is shorter. The acute health hazard index for each pollutant is defined as the short-term (e.g., 1-hour) concentration of the noncriteria pollutant divided by its acute REL. Because acute effects are predominantly manifested in one organ/system (i.e., respiratory system), acute health hazard indices for individual pollutants are summed to calculate one overall acute health hazard index. The significance thresholds for acute health hazard index are the same as for chronic health hazard index. Acute RELs were taken from CAPCOA (1993), and updated according to Office of Environmental Health Hazard Assessment (OEHHA, 1999).

6.16.1.2 Health Risk Assessment Methodology

The methodology used to assess potential human health risks followed generally-accepted practice as described in CAPCOA (1993). The health risk assessment was conducted in three steps. First,

emissions of noncriteria pollutants from proposed sources were estimated. Second, dispersion modeling was used to compute the ground-level concentration of each noncriteria pollutant at defined boundary receptors and offsite grid and discrete receptors. Third, carcinogenic unit risk factors and chronic and acute RELs were used along with the estimated concentrations, to compute carcinogenic risk, and chronic and acute noncarcinogenic health hazard indices.

6.16.1.3 Emission Calculation Methodology

Emissions of noncriteria pollutants from the new CTGs were calculated using emission factors from the California Air Toxics Emission Factor (CATEF) database (Version 1.2; Air Resources Board [ARB], 1996) and from the Ventura County Air Pollution Control District (VCAPCD, 1994). The APCD does not publish emission factors. The volumes of natural gas combusted in existing Units 1-4 and in the proposed combined-cycle units, and resulting emissions of criteria pollutants are discussed in Section 6.2 - Air Quality. Noncriteria pollutant emissions for existing units (boilers, diesel engines, gasoline storage and dispensing and boiler cleaning) were calculated using emission factors from the 1991 Air Toxics "Hot Spots" (AB2588) report (PG&E, 1991).

Maximum 1-hour and annual emissions from existing and proposed sources are calculated for the conservative scenario described in Section 6.2 - Air Quality. Boiler (existing) or Project turbine emission factors (in units of pounds per million standard cubic feet of natural gas [lbs/MMscf]) were multiplied by the maximum amount of gas combusted per hour to obtain maximum hourly emission rates in units of pounds per hour (lbs/hr). The worst-case annual operating scenario for the emission of noncriteria pollutants from the turbines assumed a maximum of up to 8,000 full-load hours per turbine which includes up to 4,000 hours of duct-fired operation plus up to 400 start-up hours. Maximum annual emission rates equal the same emission factors times the maximum amount of natural gas burned in a year. Emissions for the existing boilers were calculated using maximum hourly fuel use for acute impacts and actual historical fuel use for chronic and carcinogenic impacts.

6.16.1.4 Dispersion Modeling Methodology

Noncriteria pollutant emission rates, calculated as described above, were combined with other input information (e.g., stack height, exhaust temperature) to run a dispersion model. The EPA-approved Industrial Source Complex Short Term Version 3 (ISCST3, issued January 10, 2000 dispersion model was used to compute ground-level concentrations at boundary receptors, gridded receptors

surrounding the power plant within 10 miles, and sensitive receptors within 2 miles. The hourly meteorological data used in the model are the same as used in the air quality analysis (see Section 6.2.5).

To identify the locations of maximum impact, several sets of receptors were used as described in Section 6.2.5.3. Sensitive receptors do not need to be mapped because the health risks described herein are not significant, and hence, do not define an "…area exposed to the substances…"

The dispersion model computed the maximum hourly and annual average concentrations of each noncriteria pollutant at each receptor. Electronic input and output files for the ISCST3 modeling runs are provided under separate cover to the Commission and APCD.

6.16.1.5 Calculation of Health Effects

The dispersion modeling described in Section 6.16.1.4. computed concentrations of noncriteria pollutants at offsite receptors. It was conservatively assumed that a person located at each receptor would be exposed continuously to the computed concentration 24 hours every day for 70 years. In reality, a person may be at the location only 8 hours a day, 5 days a week for 46 years (e.g., workplace, day care center). For such individuals, the calculated potential health risk is overstated more than six times.

The results of the dispersion modeling analysis were used with the CARB Health Risk Assessment (HRA) model to determine risks. The model computes carcinogenic risk by multiplying the modeled maximum annual concentration of each noncriteria pollutant by its unit risk factor, and summing the resultant risks from all noncriteria pollutants. Chronic health hazard indices were computed by dividing the maximum annual concentrations by the chronic RELs. Similarly, acute health-based indices were computed by dividing the maximum 1-hour concentrations by the acute RELS.

The use of EPA-approved dispersion modeling and CAPCOA health risk assessment methodology provides an upper-bound estimate of potential risks. Actual risks are expected to be substantially lower because of the following conservative aspects of the health risk assessment methodology:

- The maximum ground-level concentration computed at a receptor is assumed to remain there 24 hours each day for 70 years.

- The carcinogenic unit risk factors are determined from the lowest concentrations at which effects are observed. These lowest concentrations are then divided by a safety factor between 10 and 1,000 to protect human health with an adequate margin for error.

6.16.1.6 Significance Criteria

Public health-related significance criteria were determined based on California Environmental Quality Act (CEQA) Guidelines, Appendix G, Environmental Checklist Form (approved January 1, 1999), and on performance standards and thresholds adopted by responsible agencies. An impact at the nearest receptor may be considered significant if the Project results in a facility-wide:

- Carcinogenic risk of 10^{-5} at any point on the boundary or offsite (with application of Toxics-Best Available Control Technology [BACT], and if toxic emissions do not increase according to APCD Rule 219.
- Carcinogenic risk at a sensitive receptor of 10^{-6} (Ringer, 1999), or if toxic emissions increase (APCD Rule 219).
- Chronic health hazard index of 1.0 (with application of Toxics-BACT, according to California Air Pollution Control Officers Association [CAPCOA], 1993 and if toxic emissions do not increase (APCD Rule 219). The threshold index is 0.1 if toxic emissions increase (APCD Rule 219).
- Acute health hazard index of 1.0 (with application of Toxics-BACT, according to CAPCOA, [1993], and if toxic emissions do not increase (APCD Rule 219). The threshold index is 0.1 if toxic emissions increase (APCD Rule 219).

6.16.2 EXISTING CONDITIONS

The MBPP is located in the City of Morro Bay, in San Luis Obispo County, 12 miles northwest of San Luis Obispo, California. The plant is situated west of Highway 1, near Morro Bay Harbor and east of Estero Bay. The area includes light industry, commercial operations and marine, recreational and residential uses.

Potential public health risks from existing emissions have been analyzed. Public health impacts from actual emissions of natural gas combustion from Units 1 through 4 were assessed, along with 1989 emissions from the other sources listed in Table 6.16-2. Units 1 through 4 have been operating solely on natural gas since March 28, 1995 when fuel oil was last burned at MBPP. Previous health risk assessments (PG&E, 1991; Carnot, 1994) were based on air emissions in 1989, and hence, included fuel oil combustion. The resulting risks were higher than those calculated now to characterize existing conditions. Noncriteria pollutants emitted from natural-gas

TABLE 6.16-2

"EXISTING"(1) EMISSION SOURCES
MORRO BAY POWER PLANT

SOURCE NAME	FUEL OR MAIN SUBSTANCE	LOCATION		STACK			
		UTM(E)(2) (Meters)	UTM(N)(3) (Meters)	HEIGHT (Meters)	DIAMETER (Meters)	TEMPERATURE (ºK)	VELOCITY (Meters/Second)
Units 1 and 2	Natural Gas	694,753.9	3,916,231.0	137.16	4.51	412	22.60
Unit 3		694,795.2	3,916,204.7	137.16	4.32	400	27.40
Unit 4		694,834.3	3,916,179.8	137.16	4.32	399	25.60
Fire Pump Engine 2	Diesel	694,688.9	3,916,256.0	4.57	0.10	422	29.00
Fire Pump Engine 3		694,738.9	3,916,381.0	5.49	0.11	422	39.90
Fire Pump Engine 4		694,738.9	3,916,386.0	5.49	0.11	422	39.90
Emergency Generator		694,873.9	3,916,286.0	3.05	0.11	422	23.20
Motor Vehicle Fuel Dispenser	Gasoline	695,073.9	3.916,281.0	1.22	0.10	283	1.00
Boiler Charging(4)	Hydrazine	694,823.9	3.916,326.0	1.22	0.10	283	1.00

98-710/Rpts/AFC(text) Tbls/Sec 6 (10/17/00/kh)

(1) These sources were reported in Carnot (1994), based on PG&E (1991), ad hence, represented sources as of approximately 1990.
(2) UTME(E) = Universal Transverse Mercator, east in NAD 27.
(3) UTM(N) = Universal Transverse Mercator, north in NAD 27.
(4) "Boiler charging" referred to the continuous injection of hydrazine into the condensate and feed water system for oxygen scavenging. Residual hydrazine enters the boiler steam drum and decomposes to ammonia and nitrogen emissions in boiler blowdown.

and diesel fuel combustion, and those volatilizing from other facility sources are listed in Table 6.16-3. The list excludes noncriteria pollutants emitted by fuel oil combustion prior to March 28, 1995.

Emission factors for each criteria pollutant are listed in Table 6.16-4, while the resulting maximum hourly and annual emission rates are listed in Table 6.16-5. These maximum emission rates are used in the ISC3 air dispersion model to compute maximum hourly and annual ground-level ambient concentrations shown in Table 6.16-6. Maximum concentrations of boiler-related noncriteria pollutants (i.e., benzene, formaldehyde) are used with the unit risk factors and RELs in Table 6.16-4 to compute the maximum potential health risks from the existing boilers shown in Table 6.16-7.

Considering multiple exposure pathways, the potential carcinogenic risk of existing boiler emissions to the maximally exposed individual is 1.4-in-1-million. This potential risk is less than the significance criterion of 10^{-5} (i.e., 10-in-1-million) used by the San Luis Obispo County Air Pollution Control District (APCD) (Rule 219).

Potential chronic and acute noncarcinogenic health hazard indices from the existing boilers at MBPP are potentially 0.002 and 0.06, respectively, which are both less than their significance criteria of 1.0.

Existing emissions include substances listed as Proposition 65 constituents under the California Safe Drinking Water and Toxic Enforcement Act of 1986. These substances include carbon monoxide, benzene, formaldehyde and used engine oil. The health risk assessment, applied to the noncriteria pollutants benzene and formaldehyde, indicated that the potential carcinogenic risks of these Proposition 65 substances were less than significant. The air quality impact analysis in Section 6.2 showed that the ambient concentration of carbon monoxide would be less than the most stringent ambient air quality standard, and hence, protective of public health (i.e., less than significant impact).

To be conservative, Duke Energy developed and posted Proposition 65 warning signs at various locations on the plant site to assure that visitors and employees would know that such substances existed onsite. Further, Duke Energy places a Proposition 65 notice in the local newspapers on a quarterly basis to inform the community that MBPP emits these substances.

TABLE 6.16-3

NONCRITERIA POLLUTANTS(1)
MORRO BAY POWER PLANT

POLLUTANT	SOURCES			
	Diesel Exhaust	Gasoline Vapor	Natural Gas Exhaust	
			Boiler	Turbine
Acetaldehyde				(3)
Acrolein				(3)
Ammonia			(4)	(5)
Benzene			(2)	(3)
1,3-Butadiene				(3)
Diesel Exhaust Particulate	√			
Ethylbenzene				(3)
Formaldehyde			(2)	(3)
Gasoline Vapor		√		
Naphthalene				(3)
PAHs				(3)
Propylene Oxide				(3)
Toluene				(3)
Xylene				(3)

98-710/Reports/AFC Tbls&Figs (10/18/00/rm)

(1) Excluding pollutants produced only by fuel oil combustion in boilers, which ended March 28, 1995.
(2) ARB (1999).
(3) ARB (1991a).
(4) From conversion of hydrazine used currently in boiler charging process.
(5) Ammonia slip from selective catalytic reduction systems to be installed to control NO_x emissions as part of the Project.

TABLE 6.16-4

CARCINOGENIC UNIT RISK FACTORS AND REFERENCE EXPOSURE LEVELS FOR NONCRITERIA POLLUTANTS(1) MORRO BAY POWER PLANT

NONCRITERIA POLLUTANT	CARCINOGENIC UNIT RISK FACTOR $(\mu g/m^3)^{-1}$	REFERENCE EXPOSURE LEVEL (REL) $(\mu g/m^3)$	
		Chronic	Acute
Acetaldehyde	2.7E-06	9.0	--
Acrolein	--	0.02	0.19
Ammonia	--	200	3,200
Benzene	2.9E-05	60	1,300
1,3-Butadiene	1.7E-04	--	--
Diesel Exhaust Particulate	3×10^{-4}	5	--
Ethylbenzene	--	2,000	--
Formaldehyde	6.0E-06	3.0	94
Naphthalene	--	9	--
Propylene Oxide	3.7E-06	30	3,100
Sulfates	--	--	--
Toluene	--	300	37,000
Xylene	--	700	22,000
Gasoline Vapor	--	2,100	--

98-710/Reports/ AFC Tbls&Figs (10/19/00/rw)

-- = None available.
(1) OEHHA (1999).

TABLE 6.16-5

MAXIMUM SCENARIO EMISSIONS OF NONCRITERIA POLLUTANTS FROM EXISTING SOURCES MORRO BAY POWER PLANT

NONCRITERIA POLLUTANT	EMISSION FACTORS	EMISSION RATE	
		Hourly(1) (lb/hr)	Annual(2) (tpy)
Ammonia	(3)	0.12	0.28
Benzene	1.21E-03 lb/MM scf (4)	0.012	0.017
Diesel Exhaust Particulate	0.31 lbs/1,000 gal (5)	--	6.25×10^{-3}
Formaldehyde	1.27E-02 lb/MM scf(4)	0.13	0.18
Gasoline Vapor	20 lbs/1,000 gal (6)	0.58	0.012

98-710/Reports/ AFC Tbls&Figs (10/19/00/rw)

(1) Calculated as maximum emission factor times maximum hourly use rate of natural gas.
(2) Calculated as maximum emission factor times maximum annual use rate of natural gas.
(3) Based on 30 ppb hydrazine in blowdown and usage factors from 1991 AB2588 report.
(4) From 1991 AB2588 report.
(5) AP-42 (USEPA, 1996), Table 3.3-1. Assume 139,000 Btu/gal.
(6) AP-42 (USEPA, 1995), Table 5.2-7 (storage plus dispensing), based on annual throughput of 8,365 gal/yr.

TABLE 6.16-6

MAXIMUM OFFSITE GROUND-LEVEL CONCENTRATIONS OF NONCRITERIA POLLUTANTS FROM EXISTING SOURCES MORRO BAY POWER PLANT

NONCRITERIA POLLUTANTS	MAXIMUM OFFSITE GROUND-LEVEL CONCENTRATIONS ($\mu g/m^3$)	
	1-Hour	Annual
Ammonia	155.6	0.29
Benzene	6.8	7.7×10^{-5}
Diesel Exhaust Particulate	--	4.5×10^{-3}
Formaldehyde	0.51	1.4×10^{-4}
Gasoline Vapor	4,682	5.4×10^{-2}

98-710/Rpts/AFC(text) Tbls&Figs (Sect. 6.16) (10/17/00/rm)

TABLE 6.16-7

MAXIMUM POTENTIAL HEALTH RISKS FROM EXISTING BOILERS MORRO BAY POWER PLANT

SOURCE	MAXIMUM CARCINOGENIC RISK	MAXIMUM NONCARCINOGENIC RISK	
		Chronic Hazard Index	Acute Hazard Index
Existing Boilers	1.4×10^{-6}	0.002	0.06
Significance Threshold	10^{-5} (APCD Rule 219; CAPCOA, 1993)	1.0	1.0
	10^{-6} (Sensitive Receptor)		
Significance Level	Insignificant	Insignificant	Insignificant

98-710/Rpts/AFC(text) Tbls&Figs (Sect. 6.16) (10/14/00/kh)

Combustion of oil at MBPP up to March 28, 1995 and the normal practice of soot-blowing to clean exhaust duct surfaces has caused some limited corrosion of the steel in these ducts. Occasionally, rust-like particles are emitted from the stacks of the existing units. These particles are too large to be inhaled into human respiratory systems, and hence they are not significant to public health.

6.16.3 IMPACTS

Potential health impacts from construction and operation of the proposed new CTGs are discussed separately because the emissions are different in type, magnitude and locations.

6.16.3.1 Construction Impacts

Construction of the Project is expected to take approximately 21 months, ending in 2003 (prior to operation of the Project CTGs). After the CTGs begin operation in 2003, demolition of existing facilities will begin. Demolition will be completed in 2007. No significant public health effects are expected during construction or demolition because construction and demolition practices would comply with the laws, ordinances, regulations and standards (LORS) discussed in Section 7.0. Worker safety during construction and demolition is assured by strict adherence to the safety practices discussed in Section 6.17.

Temporary emissions from construction and demolition, and dispersion modeling of PM_{10}, CO and NO_x emissions was performed as described in Section 6.2.6.6 and Appendix 6.2-5. Because these emissions are temporary and localized, no long-term carcinogenic or chronic noncarcinogenic impacts to the public result. Maximum concentrations are expected to occur at locations along the immediate property boundary.

Asbestos, lead and other hazardous waste will be generated during construction of the Project and subsequent demolition of existing facilities. Section 6.14 - Waste Management describes how hazardous and nonhazardous wastes will be managed to prevent significant impacts on public health or the environment.

6.16.3.2 Operations Impacts

The Project has design features that will keep the potential public health impacts below significance thresholds. The use of combined-cycle gas turbine technology will burn the least amount of natural gas needed to generate 1,200 megawatts of electric power.

Potential hazards were identified by evaluating the trace amounts of noncriteria pollutants that will be emitted to the air. The new natural gas-fired combined-cycle units, equipped with SCR, will be the primary source of potential emissions of noncriteria pollutants not already accounted for in Section 6.16.2. Table 6.16-8 lists sources and locations and stack data related to noncriteria pollutants that would be emitted from MBPP after completion of the Project.

6.16.3.3 Emissions

Maximum hourly and annual emission rates for each noncriteria pollutant from the four gas turbines are presented in Table 6.16-9. The ammonia listed in Table 6.16-9 is the continuous small amount of "slip" from the SCR control of NO_x emissions; it is not related to storage of aqueous ammonia. Aqueous ammonia and other hazardous materials used and stored onsite are discussed in Section 6.15 - Hazardous Materials Handling. These materials do not emit noncriteria pollutants during normal use and storage. An emission could only occur from an accidental release, whose potential offsite consequences are discussed in Section 6.15 - Hazardous Material Handling. Emissions and potential public health effects of criteria pollutants are discussed in Section 6.16.4.3.

Dispersion modeling was used to compute the maximum hourly and annual average concentrations of each noncriteria pollutant at each receptor. The maximum 1-hour and annual offsite concentrations for each constituent are listed in Table 6.16-10. Electronic input and output files for the ISCST3 modeling runs are provided under separate cover to the Commission and APCD.

6.16.4 RESULTS

The results are presented separately for the potential carcinogenic (Section 6.16.41) and noncarcinogenic (Section 6.16.4.2) impacts of the emitted noncriteria pollutants. The potential health effects of criteria pollutant emissions are discussed relative to ambient air quality standards in Section 6.16.4.3.

TABLE 6.16-8

PROJECT EMISSION SOURCES
MORRO BAY POWER PLANT

SOURCE NAME		FUEL	LOCATION		STACK			
			UTM(E)[1] (Meters)	UTM(N)[2] (Meters)	Height (Meters)	Diameter (Meters)	Temperature (° K)	Velocity (Meters/Second)
CTGs	Stack 1	Natural gas	694,624.0	3,916,557.8	44.2	5.486	353.6	18.4
	Stack 2		694,609.6	3,916,603.4	44.2	5.486	353.6	18.4
	Stack 3		694,644.7	3,916,564.3	44.2	5.486	353.6	18.4
	Stack 4		694,630.4	3,916,609.9	44.2	5.486	353.6	18.4
Fire Pump Engine 2		Diesel	694,688.9	3,916,256.0	4.57	0.10	422	29.00
Fire Pump Engine 3			694,738.9	3,916,381.0	5.49	0.11	422	39.90
Fire Pump Engine 4			694,738.9	3,916,386.0	5.49	0.11	422	39.90
Emergency Generator			694,873.9	3,916,286.0	3.05	0.11	422	23.20
Motor Vehicle Fuel Dispenser		Gasoline	695,073.9	3,916,281.0	1.22	0.10	283	1.00

98-710/Rpts/AFC(text) Tbls&Figs (Sect. 6.16) (10/17/00/rm)

(1) UTM(E) = Universal Transverse Mercator, east in NAD 27.
(2) UTM(N) = Universal Transverse Mercator, north in NAD 27.

TABLE 6.16-9

MAXIMUM SCENARIO EMISSIONS OF NONCRITERIA POLLUTANTS FROM PROJECT TURBINES MORRO BAY POWER PLANT

NONCRITERIA POLLUTANT	EMISSION FACTORS[1] (lb/MMscf)	EMISSION RATE	
		Hourly[2] (lb/hr)	Annual[3] (tpy)
Acetaldehyde	6.86×10^{-2}	0.56	2.24
Acrolein	6.43×10^{-3}	5.4×10^{-2}	0.21
Ammonia	5 ppmv slip	57.2	240.4
Benzene	1.36×10^{-2}	0.11	0.44
1,3-Butadiene	1.27×10^{-2}	1.1×10^{-3}	4.2×10^{-3}
Diesel Exhaust Particulate	0.31 lb/1,000 gal[4]	--	6.25×10^{-3}
Ethylbenzene	1.79×10^{-2}	0.15	0.59
Formaldehyde	0.11	0.92	3.6
Gasoline Vapor	20 lb/1,000 gal[5]	0.58	1.2×10^{-2}
Naphthalene	1.66×10^{-3}	1.4×10^{-2}	5.4×10^{-2}
PAHs	$6.60 \text{ X } 10^{-4}$	5.5×10^{-3}	2.2×10^{-2}
Propylene Oxide	4.78×10^{-2}	0.4	1.6
Toluene	7.1×10^{-2}	0.6	2.3
Xylene	2.61×10^{-2}	0.22	0.85

98-710/Reports/ AFC Tbls&Figs (10/19/00/rw)

(1) From CATEF database in units of lb/MMscf except as otherwise noted.
(2) Calculated as a maximum emission factor times maximum hourly use rate of natural gas.
(3) Calculated as maximum emission factor times maximum annual use rate of natural gas.
(4) AP-42 (USEPA, 1996), Table 3.3-1. Assume 139,000 BTU/gal.
(5) AP-42 (USEPA, 1995), Table 5.2-7 (storage plus dispensing), based on annual throughput of 8,365 gal/yr.

TABLE 6.16-10

MAXIMUM FUTURE OFFSITE GROUND-LEVEL CONCENTRATIONS OF NONCRITERIA POLLUTANTS AFTER PROJECT MORRO BAY POWER PLANT

NONCRITERIA POLLUTANTS	MAXIMUM OFFSITE GROUND-LEVEL CONCENTRATIONS ($\mu g/m^3$)	
	1-Hour	Annual
Acetaldehyde	0.65	6.8×10^{-3}
Acrolein	6.0×10^{-2}	6.4×10^{-4}
Ammonia	64.2	0.73
Benzene	6.8	1.4×10^{-3}
1,3-Butadiene	1.2×10^{-3}	1.3×10^{-5}
Diesel Exhaust Particulate	--	4.5×10^{-3}
Ethylbenzene	0.17	1.8×10^{-3}
Formaldehyde	1.0	1.1×10^{-2}
Gasoline Vapor	4,682	5.4×10^{-2}
Naphthalene	1.6×10^{-2}	1.7×10^{-4}
Propylene oxide	0.45	4.8×10^{-3}
Toluene	0.67	7.1×10^{-3}
Xylene	0.25	2.6×10^{-3}

98-710/Rpts/AFC(text) Tbls&Figs (Sect. 6.16) (10/17/00/rm)

TABLE 6.16-11

MAXIMUM POTENTIAL HEALTH RISKS AFTER PROJECT MORRO BAY POWER PLANT

SOURCE	MAXIMUM CARCINOGENIC RISK	MAXIMUM NONCARCINOGENIC RISK	
		Chronic Hazard Index	Acute Hazard Index
Project	2.5×10^{-6} (All Receptors) 0.7×10^{-6} (Sensitive Receptor)	0.009	0.4
Significance Threshold	10^{-5} (CAPCOA, 1993)	1.0	1.0
	10^{-6} (Sensitive Receptor)		
Significance Level	Insignificant	Insignificant	Insignificant

98-710/Rpts/AFC(text) Tbls&Figs (Sect. 6.16) (10/17/00/kh)

6.16.4.1 Estimated Carcinogenic Risks

Table 6.16-11 presents the maximum offsite carcinogenic risk from the Project. Maximum carcinogenic risk at any receptor is 2.4 in one million; 1.3 in one million of this is due to the 1-hour weekly test of existing diesel-fueled emergency equipment. These risks are lower than significance thresholds. The location of the insignificant maximum cancer risk is shown in Section 6.2. Carcinogenic risk to sensitive receptors is 0.7 in one million. Again, over half of this risk is due to the existing diesel-fueled emergency equipment.

6.16.4.2 Estimated Noncarcinogenic Risks

Table 6.16-11 presents the calculated maximum chronic hazard index of 0.009. This index is less than one percent of the significance criterion of 1.0. The location of the insignificant maximum chronic health hazard index is shown in Section 6.2.

Table 6.16-11 presents the calculated maximum acute hazard index 0.4. This index is less than half of the significance criterion of 1.0. The location of the insignificant maximum acute health hazard index is shown in Section 6.2.

Because the chronic and acute health hazard indices are well below their significance criteria of 1.0, the Project will have no significant noncarcinogenic health effects.

6.16.4.3 Criteria Pollutants

Emissions of four criteria pollutants from the routine operation of the Project were modeled and evaluated for their impacts on air quality in Section 6.2. Maximum predicted concentrations from the Project were compared with the Federal and State Ambient Air Quality Standards, which are concentration limits that protect public health of the most sensitive individuals, with a margin of safety, and also serve as inhalation RELs. With the exception of the state 24-hour PM_{10} which is already being exceeded, modeling of NO_2, CO, SO_2 and PM_{10} indicate that these health-protective standards will not be exceeded. Therefore, potential health effects from emission of criteria pollutants will be below thresholds of significance.

6.16.4.4 Public Health Risks - Hazardous Materials Stored and Used Onsite

Section 6.15 - Hazardous Materials Handling presents an assessment of potential offsite consequences in the unlikely event of an accidental release of aqueous ammonia, the only

substance used or stored onsite in quantities sufficient to require offsite consequence analysis. Design features have been incorporated into the Project to keep potential offsite public health impacts of even a hypothetical worst-case release below a threshold of insignificance.

6.16.4.5 Summary of Impacts

The health risk assessment indicates that emissions of noncriteria pollutants arising from the construction and operation of the Project will not cause significant public health impacts. Results from criteria pollutant modeling for the Project indicate that with the exception of the state 24-hour average PM_{10} standard which is already being exceeded, potential ambient concentrations of NO_2, CO, SO_2 and PM_{10} will be below ambient air quality standards established to protect public health, including sensitive segments of the population. Hence, emissions of criteria pollutants from the Project are not expected to cause significant public health impacts.

6.16.4.6 Cumulative Impacts

Existing onsite sources that are not part of the Project and offsite sources that already exist or are planned for the future, were considered for potential cumulative impacts. Emissions from the offsite projects listed in Table 6.1-1 are mostly associated with initial short-term construction, not with long-term operation, and hence, cannot cause carcinogenic or chronic noncarcinogenic public health impacts. Small amounts of long-term operational emissions will be generated by natural-gas heating and vehicular use associated with a housing tract. Similarly, temporary construction-type emissions characterize the onsite demolition of tanks that precedes construction of the Project and demolition of other existing facilities after the Project is constructed.

6.16.5 MITIGATION MEASURES

Based on the design and operational features that have been incorporated into the Project and the results of the health risk assessment, no mitigation measures are required.

6.16.6 SIGNIFICANT UNAVOIDABLE ADVERSE IMPACT

No significant unavoidable adverse impacts on public health will occur from the Project.

6.16.7 LAWS, ORDINANCES, REGULATIONS AND STANDARDS (LORS) COMPLIANCE

A summary of LORS related to public health is provided in Section 7.5.16. The Project will be in compliance with applicable LORS during construction and operation because of the following:

- The Project complies with all applicable APCD and federal rules and regulations that limit emissions.
- Air quality analysis, including dispersion modeling, has been conducted, and shows that ground-level concentrations of criteria pollutants are below ambient air quality standards.
- The health risk assessment of noncriteria pollutants has been conducted, and shows that potential public health impacts are insignificant.

An extensive discussion of air quality LORS is presented in Section 6.2.6. Air quality LORS were promulgated to protect public health, and hence, compliance with those LORS assures that the Project will cause no significant impacts on public health.

6.16.8 REFERENCES

California Air Pollution Control Officers Association (CAPCOA). *Air Toxics "Hot Spots" Program: Revised 1992 Risk Assessment Guidelines*. October 1993.

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